

## REVIEW:

### Bernoulli Trials:

- 1) 2 outcomes: success or failure
- 2) Probability of success stays constant
- 3) Each trial is independent
- 4) Known # of trials = Binomial  
Unknown # of trials (first success) = Geometric

## Geometric:

- until the first success

$$P(X = k) = (q)^{k-1}(p)$$

 failure = 1 - p

$$E(X) = 1/p$$

$$SD(X) = \sqrt{q/p^2}$$

## Binomial:

- a number of successes in a set number of trials

$$P(X = k) = {}_n C_k (p)^k (q)^{n-k} = \text{binompdf}(n, p, k)$$

$$P(X=10)$$

$$E(X) = np$$

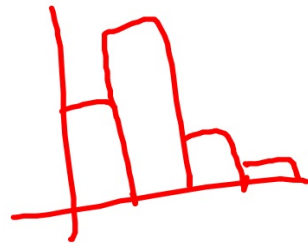
$$SD(X) = \sqrt{(n)(p)(q)}$$

— expect 10 successes & failures

Check: np and nq  $\geq 10$ .... if **doesn't** pass, then:


$$P(X \leq k) = \text{binomcdf}(n, p, k)$$

$$P(10 \leq X \leq 20)$$



If check does pass...

binomial distribution is  $\sim$  NORMAL!


$$N(np, \sqrt{npq})$$

$$P(X \leq k) = \text{normalcdf}(\text{lower}, \text{upper}, \text{mean}, \text{std.dev})$$

# #

20% + 30%

**Example:** It is known that 25% of the population has hazel eyes. We will interview people and ask their eye color.

(a) How many people do we expect to interview before we find someone with hazel eyes? *Geom.*

$$E(X) = \frac{1}{p} = 4 \text{ people}$$

(b) What is the probability of the first hazel-eyed person being the 10th person interviewed? *Geom.*

$$P(X=10) = (0.75)^9 (0.25) = 0.019$$

(c) What is the chance that the first hazel-eyed person is among the first 3 people interviewed? *= 0.578125*

$$P(X \leq 3) = P(X=1) + P(X=2) + P(X=3) \\ 0.25 + 0.1875 + 0.140625$$

Example, continued:

$$p = 0.25$$

(d) If you interview 30 people in the first hour of interviews, what is the chance that you get 12 hazel-eyed people?  $n = 30$

Binom.

$$30(0.25)$$

$$30(0.75)$$

$$\geq 10$$

$$P(X=12) =$$

$$\text{binompdf}(30, 0.25, 12)$$

$$= 0.029$$

(e) If you interview 30 people in the first hour, what is the chance that you get:  $n$

\* more than 10 hazel-eyed people?

$$P(X > 10) = 1 - P(X \leq 10) = 1 - \text{cdf}(30, 0.25, 10)$$

$$= 0.1057$$

\* less than 9?

$$P(X < 9) = P(X \leq 8) = \text{cdf}(30, 0.25, 8)$$

$$= 0.6736$$

Example continued:

(f) If you interview 50 people, what is the probability that you get:

\* between 20 and 30 hazel-eyed people?

$$P(20 \leq X \leq 30) = \text{normalcdf}(20, 30, (50 \cdot 0.25), \sqrt{50 \cdot 0.25 \cdot 0.75})$$
$$= 0.00715$$

\* less than 15 hazel-eyed people?

$$P(X \leq 15)$$
$$= \text{normalcdf}(-E99, 15, \mu, \sigma)$$

$$= 0.7929$$

Check

$$\begin{array}{l} 50(0.25) \\ 50(0.75) \end{array} \geq 10$$

Please get out the notes and worksheets  
from Friday

QUESTIONS??



Book work:

p. 402 #9, 11, 13, 18, 20, 22, 29, 35